



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/780,341	02/17/2004	Kurt A. Carlsen	BUR920000061US1	9961
21918	7590	07/26/2006	EXAMINER	
DOWNS RACHLIN MARTIN PLLC			SELLMAN, CACHET I	
199 MAIN STREET			ART UNIT	
P O BOX 190			PAPER NUMBER	
BURLINGTON, VT 05402-0190			1762	

DATE MAILED: 07/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/780,341	Applicant(s) CARLSEN, KURT A.	
	Examiner Cachet I. Sellman	Art Unit 1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 May 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 19-38 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 19-38 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Acknowledgement is made of the amendment filed by the applicant on 5/5/2006, in which claims 19-22 and 25 were amended, and claims 26-38 were added. Claims 19-38 are currently pending in U.S. Application Serial No. 10/780,341.

Response to Arguments

1. Applicant's arguments with respect to claims 19-25 have been considered but are moot in view of the new ground(s) of rejection. The applicant has amended claim 19 to include the limitation of baffling the exhaust gas to increase the residence time of the exhaust gas within the chamber which was not previously presented therefore there are new grounds of rejection.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 26-34 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for scrubbing an exhaust gas comprising a silicon as a carrier gas and arsine as the n-type dopant gas, does not reasonably provide enablement for flowing an exhaust gas into a chamber to deposit an n-doped layer of silicon or using any carrier gas and any n-type dopant gas. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with this claim. In the specification the applicant specifically describes a process and process parameters for

Art Unit: 1762

scrubbing an exhaust gas from a semiconductor process for forming an n-type dopant layer of silicon. The exhaust gas comprises silane as a carrier gas and arsine as the n-type dopant gas. The specification does not provide support for using a broad group of carrier gases and n-type dopant gases therefore it does not enable one to use the invention within the scope of the claims. Also further in claim 26, the applicant states, "causing an n-doped layer of silicon to be chemical vapor deposited", in the specification the applicant does not provide any guidance for depositing an n-type dopant layer of silicon from the exhaust gas. In claim 30, the applicant requires that the carrier gas comprise silicon and the n-type dopant gas comprise arsenic, however in the specification the applicant only discloses the carrier gas as silane and the n-type dopant as arsine which does not include the broad limitation of any carrier gas that has silicon or any n-type dopant that has arsenic therefore the specification does not enable one of ordinary skill to use any carrier gas comprising silicon and any n-type dopant gas that comprises arsenic.

4. Claims 26-34 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In claim 26, the applicant claims scrubbing an exhaust gas comprising a carrier gas and an n-type dopant gas. However, in the specification the applicant only supplies support for using silane as a carrier gas and arsine as the n-type dopant gas which does not include all carrier gases and n-type

Art Unit: 1762

dopant gases as claimed therefore the applicant does not describe to one skilled in the art that they had possession of using any carrier gas or any n-type dopant gas in the process.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 19-20 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Aitchison (US 5928426).

Aitchison discloses a method for scrubbing an exhaust gas of a manufacturing process where the gas consist of a first and second chemical component (abstract, column 5, lines 22-33) by flowing the exhaust gas through an enclosure defining a chamber and containing at least one substrate (column 2, lines 35-41, column 4, lines 31-56 and Fig. 2). When the gas enters the chamber the substrate will at as a baffle because the gas will come into contact with the edge of the plate, which will slow down the flow of the gas therefore increasing the residence time. The first chemical vapor component is chemical vapor deposited onto the substrate (column 2, lines 33-52 and column 5, lines 27-33) as required by **claim 19**. Aitchison teaches removing the active gas species in an exhaust gas as the gas travels along a plate the species (i.e.

Art Unit: 1762

Tungsten and hydrogen) are removed where the tungsten is removed first (having the highest concentration at the end of the plate) and the other active species, hydrogen) is removed thereafter (column 5, lines 26-33 and column 6, lines 8-16) as required by **claim 20**. Aitchison further discloses removing at least one substrate from the enclosure and cleaning the substrate of any film deposited; installing the substrate in the enclosure and causing the chemical component to be chemical vapor deposited on the substrate (column 8, lines 1-11 and column 11, lines 1-18) as required by **claim 25**. The substrate has apertures, which causes the exhaust gas to flow only through the apertures (column 10, lines 29-38) as required by **claim 35**. The enclosure contains a plurality of substrates in series of each other to baffle flow and contains apertures (column 10, lines 29-38) as required by **claims 36 and 38**.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aitchison.

The teachings of Aitchison as applied to claim 19 are as stated above.

Art Unit: 1762

Aitchison does not teach heating the substrate to a temperature of at least 800°C or 1100°C as required by **claims 21 and 22**.

Aitchison discloses that the process can be used for any exhaust gas that contains gas species that can be thermally treated. Aitchison further discloses that in order to promote a high temperature chemical vapor deposition reaction the temperature of the plates (substrates) must be maintained above the minimum temperature required to initiate the HTCVD reaction and heated so if there is any nonuniformity in temperature across the plates, the minimum temperature is greater than the minimum temperature to initiate the HTCVD reaction (column 5, lines 49-58). It would have been obvious to one having ordinary skill in the art the time the invention was made to heat the substrate in the claimed temperature range through routine experimentation depending on the gas species within the exhaust gas. One would have been motivated to do so because Aitchison teaches that the temperature at which the plates are heated depends on the gas species and should be high enough to promote the chemical vapor deposition onto the substrate.

9. Claims 19, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taylor (US 5945078) in view of Aitchison (US 5928426).

Taylor disclose that a large quantity of noxious substances are employed in the semiconductor industry which include silane and arsine and Taylor further states that

Art Unit: 1762

these gases are commonly pyrophoric and toxic and that their uncontrolled release can lead to a number of problems such as fire hazards and corrosion of processing apparatus therefore it is important to remove these species from the exhaust gas (column 1, lines 9-20).

Taylor does not teach flowing the exhaust gas through an enclosure defining a chamber and containing at least one substrate which baffles the exhaust gas therefore increasing the residence time of the gas in the chamber and causing the first chemical component to be chemical vapor deposited onto the substrate as required by **claim 19**.

Aitchison teaches a process of scrubbing an exhaust gas that comprises the steps of flowing the exhaust gas through an enclosure defining a chamber containing at least one substrate which baffles the exhaust gas therefore increasing the residence time of the gas in the chamber and causing the first chemical component to be chemical vapor deposited onto the substrate. Aitchison discloses that this process is cost effective, operates well in its intended environment and has an extended lifetime unlike wet scrubbing processes which are expensive to operate and maintain (column 1, lines 39-48 and column 2, lines 22-30).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the process taught by Aitchison to remove silane and arsine from exhaust of Taylor. One would have been motivated to do so because Aitchison

Art Unit: 1762

teaches that the process can be used to remove species from exhaust gas from a semiconductor process, that a gas containing silicon and arsenic can be treated using this process (column 13, lines 18-30) and that the process is cost effective and Taylor teaches that particular hydrides such as silane and arsine are commonly used in a semiconductor process and how it is important to remove them from the exhaust gas due to hazards therefore one would have a reasonable expectation of success in removing the silicon and arsenic from the exhaust gas.

10. Claims 19, 27-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibana et al. (US 5271908) in view of Aitchison (US 5928426).

Shibana et al. teaches a process for neutralizing a pyrophoric gas to eliminate the risk of explosion (abstract). The pyrophoric gas is usually used for deposition of various layers or for introducing dopants in semiconductor devices (i.e. silane and dopant such as arsine) (column 1, lines 25-32). Shibana teaches in the process usually all of the pyrophoric gas is not used in the process and is therefore exhausted out of the reactor and must be neutralized (column 1, lines 40-45).

Shibana teaches using turbulent flow to ensure complete mixing of the gas to prevent the possibility of explosion. The turbulent flow is provided by baffles or impact plates (column 2, lines 44-57). The turbulence increases the travel time within the chamber (column 58-62). Shibana teaches that the gas should be scrubbed to eliminate the toxic components (column 6, lines 1-2).

Shiban does not teach flowing the exhaust gas through an enclosure, baffling the exhaust gas and causing a component to vapor deposited as required by **claim 19**.

Aitchison teaches a process of scrubbing an exhaust gas by flowing the exhaust gas through an enclosure defining a chamber and containing at least one substrate (column 2, lines 35-41, column 4, lines 31-56 and Fig. 2). When the gas enters the chamber the substrate will act as a baffle because the gas will come into contact with the edge of the plate, which will slow down the flow of the gas therefore increasing the residence time. The first chemical vapor component is chemical vapor deposited onto the substrate (column 2, lines 33-52 and column 5, lines 27-33). Aitchison further teaches that the exhaust gas can contain arsenic and silicon (column 13, lines 20-30).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Shiban et al. to include scrubbing the exhaust as taught by Aitchison. One would have been motivated to do so because both disclose the importance of scrubbing exhaust gases that comprise a toxic component and Aitchison further discloses an operable way of scrubbing the exhaust gas therefore one would have a reasonable expectation of scrubbing the exhaust gas.

Aitchison does not teach causing an n-doped layer of silicon to be formed from the exhaust gas. However, depending on the efficiency of the chamber it would be obvious to one having ordinary skill that not all of the arsine will be removed from the stream therefore some of the gas will also deposit on the substrate along with the silicon.

The n-type dopant gas is removed from the exhaust gas as required by **claim 27**.

Aitchison does not teach heating the substrate to a temperature of at least 800°C or 1100°C as required by **claims 28 and 29**.

However, Aitchison does state that in order to promote a high temperature chemical vapor chemical deposition reaction the temperature of the plates (substrates) must be maintained above the minimum temperature required to initiate the HTCVD reaction and heated so if there is any nonuniformity in temperature across the plates, the minimum temperature is greater than the minimum temperature to initiate the HTCVD reaction (column 5, lines 49-58). It would have been obvious to one having ordinary skill in the art at the time the invention was made to heat the substrate within the claimed temperature range through routine experimentation for silane and arsine. One would have been motivated to do so because Aitchison teaches that the temperature at which the plates are heated

Art Unit: 1762

depends on the gas species and should be high enough to promote the chemical vapor deposition onto the substrate.

As stated above the carrier gas is silane and the n-type dopant gas is arsine as required by **claim 30**.

Aitchison teaches that the substrate or substrates can have a plurality of apertures and are arranged in series as required by **claims 31,32, and 34**. As shown by Shibani et al. the substrates can be arranged in series to cause a serpentine path as required by **claim 33**.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

Art Unit: 1762

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cachet I. Sellman whose telephone number is 571-272-0691. The examiner can normally be reached on Monday through Friday, 7:00 - 4:30pm.

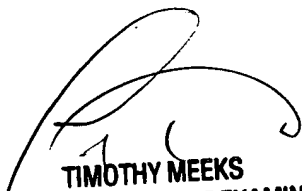
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Cachet I Sellman
Examiner
Art Unit 1762

Application/Control Number: 10/780,341
Art Unit: 1762

Page 13



TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER